Planets, Stars, and Orbs: The Medieval Cosmos, 1200-1687. Edward Grant

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BOOK REVIEWS

Feature Review

Edward Grant. *Planets, Stars, and Orbs: The Medieval Cosmos, 1200–1687.* xxiv + 816 pp., illus., tables, apps., bibl., index. Cambridge/New York: Cambridge University Press, 1994. $69.95.

This labor of love by Edward Grant occupied him, it seems, for fifteen years, but as with the masterpiece Picasso might have finished in fifteen minutes, there is a professional lifetime behind it. Grant has so completely immersed himself in the rich field of medieval cosmology that he has no difficulty in persuading us to take it seriously, and to put aside for a while the blandishments of mathematical astronomy. Based as it was on the works of Aristotle, cosmology came under the aegis of scholastic theology and natural philosophy, where different kinds of questions were being asked. The range of such questions was considerable, and the subject was indecently vigorous, bearing in mind its antiquity. For half a millennium—say, from 1200 to 1700—it occupied center stage in academic life, and did so not only because of the prestige of Aristotle but because it raised problems concerning the world as a whole in which all mankind has some potential interest, problems of the elemental spheres, the celestial regions, and what might lie beyond them. Aristotelian cosmology quickly swept the board in the later Middle Ages, and rival systems such as Neoplatonism and Hermeticism dented its reputation only superficially. It showed enormous resistance to attack from Copernican cosmology and geoheliocentric variants, and Grant's long and thorough account helps us to understand why this was so.

He begins not at the beginning but more or less at the end—with an encomium on Pierre Duhem. (The first halftone illustration is of Duhem, the second of Aristotle, and the third of Hildegard of Bingen's suitably egg-shaped cosmos.) The author himself advises impatient readers to begin with Chapter 4, but if they do so they will miss a chapter on Duhem, another on Latin and Greco-Arabic sources, and a third on the social and institutional matrix of scholastic cosmology—the state, the economy, the universities, and the Church. In the end, however, the only social influence of note turns out to have been a thoroughly bookish tradition. There were of course the theologians and their condemnations, but there again the influences were hardly of a sort that would satisfy most modern sociologists of knowledge—at least not in my neck of the woods. And when it comes to the "impact of medieval cosmology on society," Grant can only refer briefly to Christopher Columbus's information on the size of the earth, taken from Pierre d'Ailly, and to the "enormous outpouring of printed editions in the late fifteenth and sixteenth centuries" that so conveyed the scholastic world view (p. 59). Having doffed his cap to modernity in this way, with a mere sixty pages gone and over seven hundred to go, he is off and away in hot pursuit of a completely intellectual tradition, one that has not been described so fully or so faithfully from the same point of view by any previous historian. Duhem's writings, for example, were unsystematic and thrown together in too much haste. The anatomy of Edward Grant's *summa* is by comparison a pleasure to behold, this being in no small measure helped by the publisher and (anonymous) printer. It encompasses an excellent bibliography and a ninety-four-page catalogue and discussion of four hundred *questiones* of a cosmological sort. But it is in the even balance of the rest of the book that it scores so highly.

Is the world eternal, without beginning or end? Good Christian theologians were torn between their own traditions and Aristotle's arguments, and—as Grant shows at length—the outcome in favor of the former was not as clear-cut in the thirteenth century as it now seems. Was

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creation simultaneous, or did it take six days, or were both possible? As in the eternity argument, natural philosophers tried to get the best of both arguments. Was creation from nothing? Here the Bible does not give so clear a lead. A footnote to the atomists and Parmenides might have been in order, but that might have misled the reader, or at least have detracted from the way in which the scholastics' hands were tied by their theology. The same constraints operated when they discussed the finitude, shape, and place of the world—for the world must not rival God in any way. Again the scholastics played with fire and flirted with the actual infinite, but in the end left God alone in that category. This landed them in another kind of difficulty, however, when it came to discussing the place occupied by the last sphere. Grant gives a careful account of Averroes and Themistius on this point.

The world's perfection, the possibility of other worlds, and the incorruptibility of the celestial regions all turned the discussion in a different direction, one governed more by a theological treatment of God's character than by topological abstractions. It gave rise also, however, to physical questions, as when Nicole Oresme introduced questions of the Aristotelian up/down dichotomy into what we might call the *n*-body problem. Or was this a logical question? The dividing line is often hard to find. Take, for instance, the question of the extracosmic void and Robert Holkot's claim that "a vacuum exists beyond the world because a vacuum exists where a body can exist but does not" so that "a vacuum is [there] now." Grant thinks that Holkot is asserting "categorically, rather than hypothetically, the actual existence of an extracosmic vacuum," and he adds that Holkot neglects to explain whether this was a divine creation (pp. 171–172). If someone says that a vacuum is a potential for the existence of something, however, it seems uncharitable—indeed, a category mistake—to equate this view with the doctrine that the potentiality is itself a real existent, and even more so to ask whether the hypostasized "thing" was of God's creating.

Of what kind of matter are the celestial orbs, are they hard or fluid, empty or full? And what of the immobile orb, the Empyrean? Eccentrics and epicycles squeeze into the story, but only just. How do comets fit into the scheme, what of the celestial light, and what of the properties of celestial bodies and the causes of their motions? Grant's meticulous account of the various answers given to these question is not—as so many accounts in the past have been—detached from the structure of the arguments that led up to those answers. Moreover, whether his version of those arguments is acceptable is something that can usually be determined from the extensive Latin quotations in his footnotes. He never dodges the obligation to get to the bottom of the Latin. His book is a litany of names, but to have mentioned more than a handful here would have been to lose sight of the overall nature of this excellent study, which tacitly amounts to a demonstration of how Aristotelian "cosmology," born of Eudoxan astronomical cosmology, could survive in isolation from the springs that brought it into existence. From a narrow astronomical point of view it might be thought a sad story, involving the total disappearance of what it was that Aristotle had most admired in Eudoxus. Edward Grant has almost nothing to say on this score; instead, he concentrates on the way in which the discussion of a geometrically simplistic world could raise logical, theological, and physical questions that were anything but simplistic, questions that indeed had within them the seeds of much of physical science to come. His is intellectual history in the best tradition—a tradition that extends back to Aristotle himself.

J. D. NORTH

■ General

Gerald L. Geison; Frederic L. Holmes (Editors). *Research Schools: Historical Reappraisals*. (*Osiris*, 2nd Series, 8.) viii + 248 pp., illus., figs., tables, index. Chicago: University of Chicago Press, 1993. $39 (cloth); $25 (paper).

The harnessing of higher education toward research—sometimes dismissed as "an ungentlemanly, boorish, and even foolish German idea" (p. 122)—has become a key feature of the sciences since the early nineteenth century. Small groups of scientists, working in a university or other institution, pursue a program of inquiry in association with advanced students. Research schools of this kind have also figured largely in historical debate, ever since Jack Morrell's justly celebrated article of 1972 on Justus von Liebig and Thomas Thomson as "chemist breeders." This carefully edited collection, the eighth volume of the revived *Osiris*, is a welcome initiative to "spread the Morrellian gospel" (p. 227).